Effectiveness of Nurse-Led Lifestyle Intervention on Outcomes of Metabolic Syndrome Patients

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Abstract

Background: Adjustment of life style required multifactor as education, physical exercise, healthy diet, and pharmacological strategies which considered an imperative guidelines for treatment and prevention of metabolic syndrome. **Aim:** investigate the effectiveness of nurse-led lifestyle intervention on outcomes of metabolic syndrome patients**. Method:** A quasi-experimental research, a convenience sample of 160 patients attended to medical and diabetic out-patients clinics of Specialized Medical Hospital, Mansoura University. An interview questionnaire was used to accomplish this study. **Results:** High percentages of the studied groups pre-test were low self-efficiency (≤ 37.6), while high percentages of the studied groups post-test were having high self-efficiency (≥ 74.6). There were statistical significant correlation between metabolic syndrome and health-promoting lifestyle and self-efficiency among studied patients (P. value 0.01). **Conclusion:** Applying the nurse-led lifestyle applied program has positive effect on promoting self-efficacy and health promoting behaviors for metabolic syndrome patients. **Recommendations:** It is important to ensure application of lifestyle applied program by nurses as a scheduled care for metabolic syndrome patients.

Key words: Metabolic Syndrome, Nurse-Led, Life Style Intervention, Health Promoting Behaviors, Self-Efficacy.

Introduction

Today, metabolic syndrome (MetS) is considered a global epidemic disorder that is exacerbated by the increasing prevalence of physical inactivity and obesity. Primarily, MetS is related with modifiable risk factors identified with unfortunate way of life including calorie-dense foods intake, sedentary lifestyle, smoking, alcohol consumption, and stress **(Zheng, X., et al., 2020).**There are several diagnostic criteria for MetS developed by many organizations such as the World Health Organization which describe MetS in 1998 as the presence of insulin resistance as a major component of the syndrome, in conjunction with at least two of the following parameters (hypertension, hyperlipidemia, and lipoprotein reduction) High-density lipoprotein (HDL-C) cholesterol, obesity and microalbuminuria **(Zheng, X., et al., 2020).**

Likewise, the International Diabetes Federation defines MetS by having central obesity (defined as waist circumference (WC) women 80 cm in women and 94 cm in men) in addition to any of the following factors or related treatment such as increased triglycerides (lipids) Triglycerides 150 mg / dL or current treatment for this lipid abnormality), lowering HDL cholesterol (HDL-C> 40 mg / dL in women and <30 mg / dL in men or current treatment for this lipid abnormality (blood pressure) 130/85 MmHg), or previously diagnosed with high blood pressure or elevated plasma glucose or previously diagnosed with type 2 diabetes (fasting glucose 100 mg / dL). **(Saklayen, 2018; Alberti, Zimmet&Shaw, 2005).**

Because of the recently referenced risk factors for MetS center around stationary ways of life and high fat or carbohydrate diet patterns in adults with prediabetes, the preventive strategies for MetS focused on physical activity, healthy diet, and weight control **(Lin, et al.,2014).** The prevalence of MetS increasing by 24–78% in the western population and about 15–36% in the Asia-Pacific region, including Australia, Singapore, Japan, Korea, and China**(Ranasinghe, et al., 2017).**As well as, in the USA about 13% and 30% of people in developing countries and 35% has metabolic syndrome. UK statistics suggests that approximately 30–34% of adults aged from 40 to 75 years have metabolic **(Dunkley, et al., 2012).**

Without prevention and treatment of MetS there is higher probability for developing diabetes, prediabetes, and cardiovascular disease, stroke especially with presence aggravated factors including (obesity, limited physical activity, and poor glycemic control. Additionally, MetS patients also perceived a high level of stress and decreased quality of life **(Gheshlagh, Parizad, and Sayehmiri, 2016)**. It is significant for planning successful techniques and programs that attention on the difficulties of the rising commonness of MetS and consider as main goal of government's wellbeing strategy and medical care methodologies in all countries **(Bassi, et al., 2014).**

Life style modification interposition consider as the crucial guidelines for prevention and treatment of MetS all through numerous methodologies including instruction, standard physical exercise and a healthy diet, and pharmacological strategies **(Saboya, et al., 2017).**One of the most important issue for the prevention of metabolic syndrome, which must be taken care of, physical activity and regular exercise, as the practice of physical exercises strengthens the physical structure. Whereas, regular physical exercise improves insulin sensitivity, improves good cholesterol levels (HDL), reduces blood pressure, body weight, and cardiovascular risk factors **(Kellstedt, et al., 2020).**

One of the most important foundations set by the World Health Organization is raising the slogan (Health for All), which requires health promotion, which is considered one of the main challenges to health, which aims to enable people to increase control over, maintain and improve their health

status. Therefore, many countries have put in place a promotion system for health in its health plans **(Lee, and Wang, 2005)**. Health- promoting behaviors focus on caring for a healthy lifestyle, improving quality of life, and reducing treatment expenses. Preventing diseases and developing and improving the self-care skills and capabilities of individuals are among the most important of these behaviors **(Maher, et al., 2009; Dunkley, et al., 2012).**

Self-efficacy in implementing health promoting behaviours is a comprehensive and specific indicator to predict health promoting behaviours. However, this outcome was seldomly examined among patients with metabolic syndrome **(Zhang, et al., 2018).**Self-efficacy is defined as the extent to which a person can manage and implement specific activities under a given situation, so there is a significant correlation between healthy activity and self-efficacy, because health-related self-efficacy plays a vital role in promoting a healthy lifestyle **(Lee, Kang, and Lee, 2020).**

Significance of the study

Metabolic syndrome is spreading in an increasing way in the countries of the world **(Kim, et al., 2004)**. and depending on international reports of incidence rates, it was found that 25-20% of adults suffer from this syndrome, while the death rate among these people is twice the rate of risk of having a heart attack and three times the risk of having a stroke **(Mohan, and Deepa, 2006; Lao, et al, 2014).**

According to a study carried out in the United States among adolescents, it was found that metabolic syndrome is prevalent in more than a quarter of the population who suffer from obesity and in nearly seven percent of the population who suffer from overweight, with an increase in the prevalence of metabolic syndrome in children and young people in all around the world**(Levitt, and Lambert, 2002; Kassi, et al.,2011).**

The occurrence of metabolic syndrome often parallels the occurrence of obesity and the development of type 2 diabetes **(Saklayen, 2018)**. Obesity is an alarming public health challenge of the 21st century. Metabolic syndrome is one of the associated co-morbidities of obesity. Previous research suggests that the occurrence of MetS in pre-adult life persists into adulthood and the existence of obesity in childhood predisposes an individual to developing MetS in adult life .The crude prevalence of MetS in our population-based survey varied according to the definition used. The prevalence was 32% according to IDF **(Badri, et al.,2017).**

Additionaly, The prevalence of obesity is very high in the Middle East region. A recent study conducted to examine the risk factors for cardiovascular disease among Egyptians people showed that obesity has spread by twenty-nine percent, with a high proportion among females**(Abd Elaziz, et al.,2014).**

Aim of the study

The aim of this study was to investigate the effect of nurse-led lifestyle intervention program on self-

efficacy and health promoting behaviors among patients with metabolic syndrome.

Operational Definitions

Health Promotion Model is a middle-range theory that provides a holistic conceptual framework to understand the engagement of health promoting behaviours. This model recognises that an individual's adoption of health promoting behaviours is mainly influenced by his/her behavior-specific cognition and affect, which also interacts with his/her characteristics and experiences**(Pender, Murdaugh, and Parsons, 2006).**

Self-efficacy is a key behaviour-specific cognitive factor contributing to the implementation of health promoting behaviours. A high level of perceived self-efficacy reduces the perceptions of barriers and improves the likelihood of engaging in health promoting behaviours **(Becker, et al., 1993; Erin&Edward., 2015).**

Research Hypotheses

H_1: Nurse led life style intervention program will improve the self-efficacy of patients with metabolic syndrome.

H_2: Nurse led life style program will improve health promoting behavior for patients with metabolic syndrome.

Research Variables:

Independent variables*:* The Independent variables in the study is nurse led life style intervention program.

Dependent variables*:* the self-efficacy and health promoting behavior.

Subjects and Method

Study Design: A quasi experimental study design with pre and post assessments was used in this study to fulfill the aim of this study.

Study Setting: This study was carried out at medical units and diabetic out-patients clinics on the specialized medical hospital at Mansoura University in Egypt.

Subjects: The study involved a convenience sample of 160 adult patients, drawn from all the patients at medical units and diabetic out-patients clinics on the specialized medical hospital at Mansoura University from January2020 to August 2020.

Tool of data collection:

Data collection was accomplished after reviewing the recent relevant literatures:

Tool I: A Structured interview questionnaire: was used after reviewing the recent relevant literatures. It included the following parts:

Part I: Demographic data includes subjects': age, gender, marital status, level of education, occupation, family income and smoking.

Part II: Anthropometric and serological evaluation: includes waist circumference, blood pressure, blood glucose level, total cholesterol, high-density lipoprotein cholesterol (HDL-C) and triglycerides.

Tool II: Self-related ability for health practice (self-efficacy) scale: Adopted from **Becker et al., (1993).** It included 28-item for measure self-efficacy in implementing the four aspects of behaviors: nutrition (7 item), exercise (7 item), psychological well-being (7 items), and health responsibilities (7 items). Each item has 5 point choice rating from 0= "not at all" to 4 "completely". Each subscale range from 0 to 28 and the total score is the sum of the subscale (range from 0 to 112). Higher score indicate higher level of perceived self-efficacy in performing health promoting behavior. There are no reversed scored items. Nutrition: Items 1-7 Psychological Well Being: Items 8-14Exercise: Items 15-21Responsible Health Practices: Items 22-28

Tool III: Health-Promoting Lifestyle Profile II) questionnaire: Adopted from **Walker, et al., (1987)** to measure the health promoting behavior under the health promotion model. A score for overall health-promoting lifestyle is obtained by calculating a mean of the individual's responses to all 52 items; six subscale scores are obtained similarly by calculating a mean of the responses to subscale items. The use of means rather than sums of scale items is recommended to retain the 1 to 4 metric of item responses and to allow meaningful comparisons of scores across subscales. The items included on each scale are as follows: Health-Promoting Lifestyle (52 items), Health Responsibility (9 items), Physical Activity (8 items), Nutrition (9 items),Spiritual Growth(9 items),Interpersonal Relations(9 items), and Stress Management(8 items). Each item has four choice, rating as 1= never, 2= sometimes, 3= frequently, and 4 = routinely. The sum score range from 25 to 100. A higher score indicate a better implementation of health promotion behavior.

Validity and Reliability

Validity of tools was done by 7 experts from medical and nursing field to check the relevancy, clarity, comprehensiveness, and applicability of the questions. According to their opinions, minor modifications were done and the final form was developed. The reliability of the tools was tested using the internal consistency method. It was found that Cronbach's alpha reliability coefficient was 0.032, and 0.0516, for Self-related ability for health practice (self-efficacy) scale and Health-Promoting Lifestyle Profile II) questionnaire respectively.

Pilot study

Pilot study was conducted on 10% (16) of patients. This number was excluded from the studied sample to identify the obstacles and problems that may be encountered in data collection, applicability and feasibility of the research process.

Procedure for Data Collection

- An official permission from the faculty of nursing Mansura University and director of Special Medical Hospital at Mansoura University, Egypt was obtained for

carried out this study. The data were collected by researchers and nurses after training of nurses regarding how to collect data from patients prior to conducting the lifestyle intervention program to have base line data about patient condition and measure patient outcome through self-efficacy and health promoting behaviors identification.

- Development of the lifestyle intervention program based on analysis of the collected data. It was developed guided by reviewing the most recent related literature[1]. This phase take from beginning of February to end of March. In this period, the pandemic COVID-19 appeared, and Egyptian government hospitals began to apply universal standard precaution of infection prevention and control for all hospital workers and all patients, which caused a major obstacle in completing the rest of the study stages strict precaution that must be followed as decrease numbers of patients on day, short contact time with the patients after monthly visit finished. Therefore, the researchers take official permission from the director of nursing and verbal consent from the nurses in diabetes units and out patients clinics for diabetes to prepare them for applying life style intervention program for patients with metabolic syndrome by applied for them supported with colored booklet containing all the information and skills related to metabolic syndrome; all the content of booklet was explained in details to all nurses. In addition, the training program for nurses aimed to teach nurses how to apply this program for patients, and how apply the post test (post evaluation) for patients after applying the program. In the same time, our contact methods through email, telephone, or any accessible communication technology were applied for nurses and after that for patients for answering any questions and for any explanation. Therefore, the modification was done in this stage by take decision for application of life style intervention program through the nurse led method instead of applying by the researcher.
- From April to end of June. Firstly, brief physical examination was performed including anthropometric measurements by nursing as following: Body weight was measured with a high-precision scale. Weights were taken at the same time at each session, with the light clothes and bare foot, and height was measured to the nearest centimeter in the standing position using a wall stadiometer. Body mass index (BMI) calculated as the weight in kg divided by the square of the height in meters. Waist circumference was measured midway between the lowest rib and the iliac crest. Blood pressure was measured with anautomatic digital sphygmomanometer from the right arm. The average of 2 measurements taken at a 2- or 3-minute interval with the participants in a sitting position after resting for at least 15 minutes was used. Then, serological assessment was done as following: Blood samples were obtained from the antecubital vein with the

participants in a seated position after an overnight fast, and analyzed in the Biomedicine Laboratory of the hospital to assess fasting blood glucose, total cholesterol, high-density lipoprotein cholesterol (HDL-C), low density lipoprotein (LDL), and triglycerides. The samples were analyzed using an enzymatic method.

- The life style intervention program was implemented by researchers and nurses in morning shift through 4 sessions including theoretical and practical training regarding life style intervention for patients with metabolic syndrome. Each session take 30-45 hours.
- Each patient was evaluated via scheduling meeting with them at the same day for his/her follow up appointment. Evaluation included anthropometric measurements, serological evaluation. This phase covered a period of 1 month beginning of July to end of August 2020.

Life style Intervention Program for patients:

Covered the following main items regarding metabolic syndrome and life style with it including:

- Knowledge about metabolic syndrome as definition causes, risk factors, clinical manifestation, complications medical treatment.
- Healthy weight and how maintain ideal body weight.
- Healthy nutrition.
- Importance of exercise.
- Various exercise which help promoting healthy weigh and aid for weight reduction.
- Smoking cessation.
- Strategies for prevention of diabetes mellitus.
- Strategies for prevention of elevation of cholesterol in blood.

Ethical Consideration

Verbal consent was obtained from each patient to be included in the study after explaining the aim and importance as well as stressing on confidentiality of the collected data. In addition verbal consent was obtained from all nurses whose volunteer to involve in the nurse led program. The researchers emphasized that the participation on the study are absolutely voluntary and each patient and nurse has the right to withdraw from the study without explaining any reason. The process of data collection did not disturb the harmony of the work for nurses. All data collected were used for the study purpose only and were processed in total confidentiality.

Statistical Analysis

The statistical Package for (SPSS) version (23) was used to analyze data. Descriptive statistics was used for the quantitative data in knowledge, and demographic data. Descriptive statistics included: Frequencies, percentages, Cross tabulation, and independent t-test. The level of significance for this study was set at ($p = 0.05$) to detect any indication of differences found in the data available Pearson Correlation.

Results

Table 1: Frequency Distribution for Participants Regarding Their Demographic Characteristic N=160

Variables	N	%
Age	48.73±7.83	
Sex		
• Male	110	68.8
• Female	50	31.3
Marital Status		
• Married	160	100.0
Level of Education		
• Middle education	10	6.3
• Read and write	60	37.5
• Illiterate	90	56.3
Occupation		
• Working	146	91.3
• Not working	14	8.8
Residences		
• Urban	33	20.6
• Rural	127	79.4
Income		
• Not sufficient	160	100.0
Smoking		
• Yes	49	30.6
• No	111	69.4
Types of Smoking		
• Cigarette	28	18.1
• Shisha	16	10.0
• Both of them	5	3.1
Smoking Cessation		
• Yes	29	16.9
• No	20	12.5

Table (1): Reports that the mean age of the studied subjects was (48.73±7.83), all of them are married, the highest percentage of them are males (68.8%), Illiterate (56.3%), working (91.3%), from rural area (79.4%), and smoker (69.4%)[(18.1%) cigarette smoking and (16.9%) stop smoking]. All of them have insufficient income (100%).

Table 2: Frequency Distribution for Patient Regarding Metabolic Risk Factors Pre and Post Application of the Nurse-Led Lifestyle Intervention Program N=160

Variables	Answer	Preprogram		Post program		p.v	Chi-square
		N	%	N	%		
Waist Circumference ≥94 cm for men	**Yes**	67	41.9	٥٧	35.6	0.151 ns	0.301
	No	93	58.1	103	64.4		
≥80 cm for women	**Yes**	35	21.9	34	21.3	.500 ns	1.00
	No	125	78.1	126	78.8		
Hypertension SBP ≥130	**Yes**	86	53.8	86	53.8	----	----
	No	74	46.3	74	46.3		
DBP ≥85 mmHg	**Yes**	86	53.8	71	44.4	0.059 . ns	2.813
	No	74	46.3	89	55.6		
FBG level ≥100 mg/dL	**Yes**	117	73.1	90	56.3	0.001**	9.973
	No	43	26.9	70	43.8		
HDL cholesterol <40 mg/dL in men	**Yes**	58	36.3	47	29.4	.117ns	1.715
	No	102	33.8	113	70.6		
<50 mg/dL in women	**Yes**	28	17.5	21	13.1	.176ns	1.180
	No	132	82.5	١٣٩	86.9		
elevated triglyceride levels defined as ≥150 mg/dL	**Yes**	100	62.5	102	63.7	.454 ns	0.053
	No	60	37.5	58	36.3		

Chi –Square test Non significant P=>0.05 **Significant p= < .05**

SBP: Systolic blood pressure; **FBG: Fasting blood glucose; HDL:** High density lipoprotein

Table 2: Show that there is statistical difference between pre and post regarding hypertension and high significance difference regarding FBG level with P. value ≤0.05 but no difference regarding waist circumference, low HDL cholesterol and elevated triglyceride levels defined.

Figure 1: Distribution of Patient Having Metabolic Syndrome Pre and Post Application of the Nurse-Led Lifestyle Intervention Program (N=160).

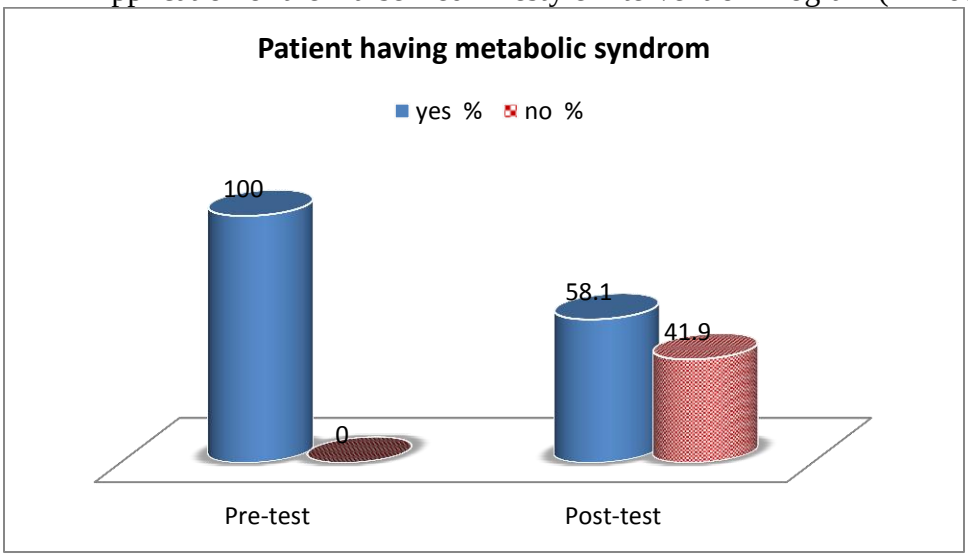

Figure1: Illustrate that all the studied subjects are having metabolic syndrome pre-test while more than half of them are having metabolic syndrome post-test.

Figure 2: Distribution of the Studied Patients Regarding Self-Related Ability for Health Practice (Self-Efficacy) (N =160)

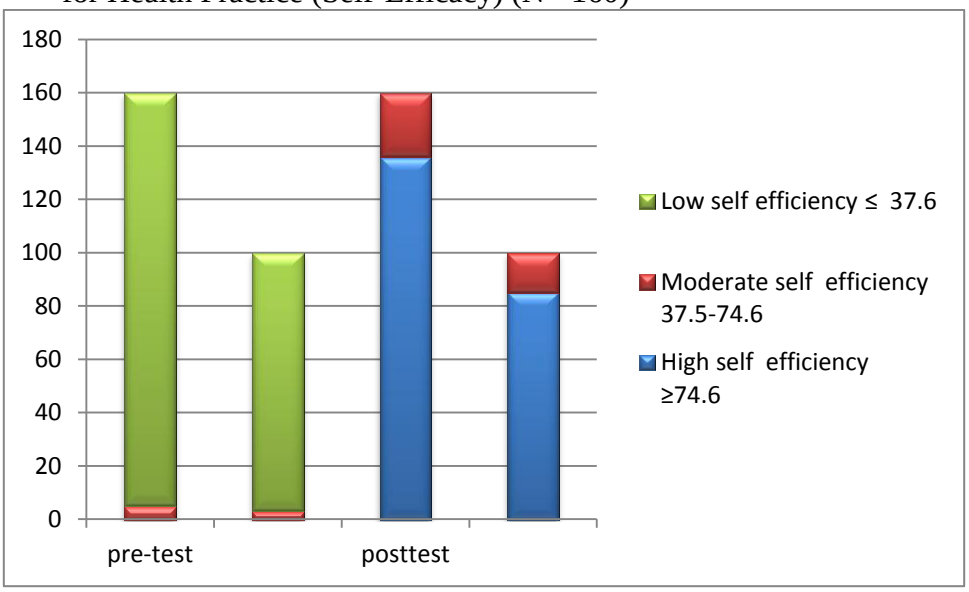

Figure 2: reveals that there is high percent of the studied subjects are having low self-efficiency (≤ 37.6) pretest, while high percent of the studied subjects are having high self-efficiency (≥ 74.6) post-test.

Table 3: Mean and Frequency Distribution Regarding Self-Related Ability for Health Practice (Self-Efficacy) among Patient N =160

Total self-efficiency0-112	Follow up				Chi-Square	p. value
	Pre-test		Post-test			
	N	%	N	%		
High self-efficiency ≤ 37.3	0	0.0	136	85.0	X2: 297.50	P=0.001
Moderate self-efficiency 37.5-74.6	5	3.1	24	15.0		
Low self-efficiency≥ 74.6	155	96.9	0	0.0		
Total	160	100.0	160	100.0		
Mean ±SD	28.06±4.42		83.56± 8.64			

Chi-Square and independent t-test with P.value =0.05> not significance p=<.05 significance p=0.001 highly significance

Table 3: Demonstrate that there is a statistically significant difference between the pretest and posttest of the studied subjects regarding self-related ability for health practice (self-efficacy) (P. value 0.001).

Table 4: Mean of the Health-Promoting Lifestyle behavior among the Studied Patients (N =160)

Health-Promoting Lifestyle	Follow up		
	Pre-test mean ±SD	Post-test mean ±SD	p. value
Health Responsibility 0-27	2.568± .620	16.537±1.624	0.001
Physical activity0-24	.000±.00	9.16±3.215	
Nutrition0-27	18.46±2.370	23.89±.942	
Spiritual Growth0-27	9.50±.800	18.10±1.73	
Interpersonal relation0-27	15.65±1.17	23.00±.00	
Stress management 0-24	7.02±.88	18.00±.00	
Mean ±SD (0-156)	53.212±3.580	108.70±4.740	

Table 4: shows that there is a statistical significant difference between the pretest and posttest of the studied subjects regarding health-promoting lifestyle behavior (P. value 0.001).

Table 5: Correlation between Health-Promoting Lifestyle behavior and Self-Efficiency among Studied Patients (N =160)

Correlation		Total health promotion	Total self-efficiency	Having metabolic syndrome
Total health promotion	Pearson Correlation	----------	0.959**	.498**
	Sig. (2-tailed)	----------	0.000	0.000
Total self-efficiency	Pearson Correlation	0.959**	----------	0.494**
	Sig. (2-tailed)	0.000	----------	0.000
Having metabolic syndrome	Pearson Correlation	0.498**	0.494**	----------
	Sig. (2-tailed)	0.000	0.000	----------
**. Correlation is significant at the 0.01 level (2-tailed).				

Table 5: shows that there is a positive correlation between metabolic syndrome and health-promoting lifestyle behavior and self-efficiency among studied patients (P. value 0.01).

Figure 3: Correlation between Metabolic Syndrome and Health-Promoting Lifestyle among Studied Patients (N =160)

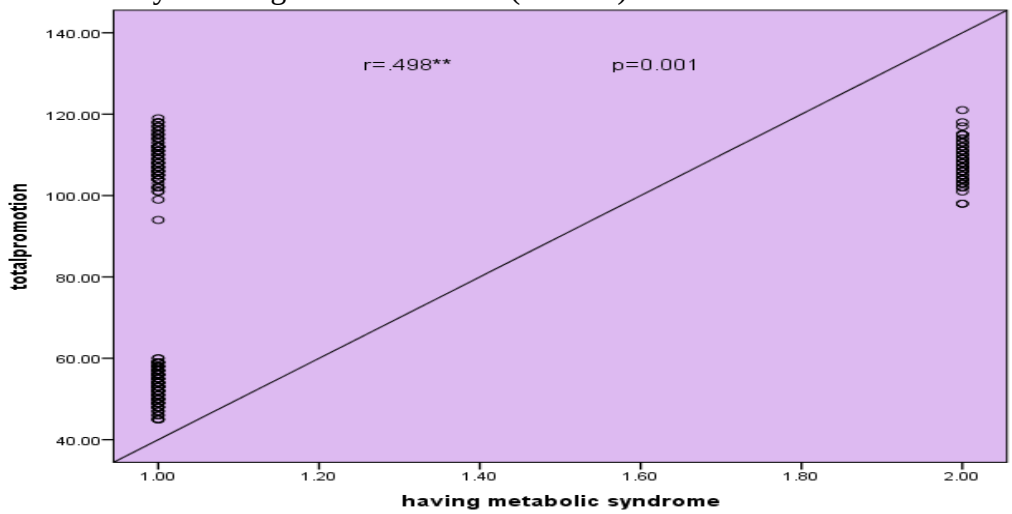

Figure 4: reveals that there is a positive correlation (r= 0.498) between metabolic syndrome and health-promoting lifestyle behavior among studied subjects (P. value 0.001).

Figure 5: Correlation between Metabolic Syndrome and Self-Efficiency among Studied Patients (N =160)

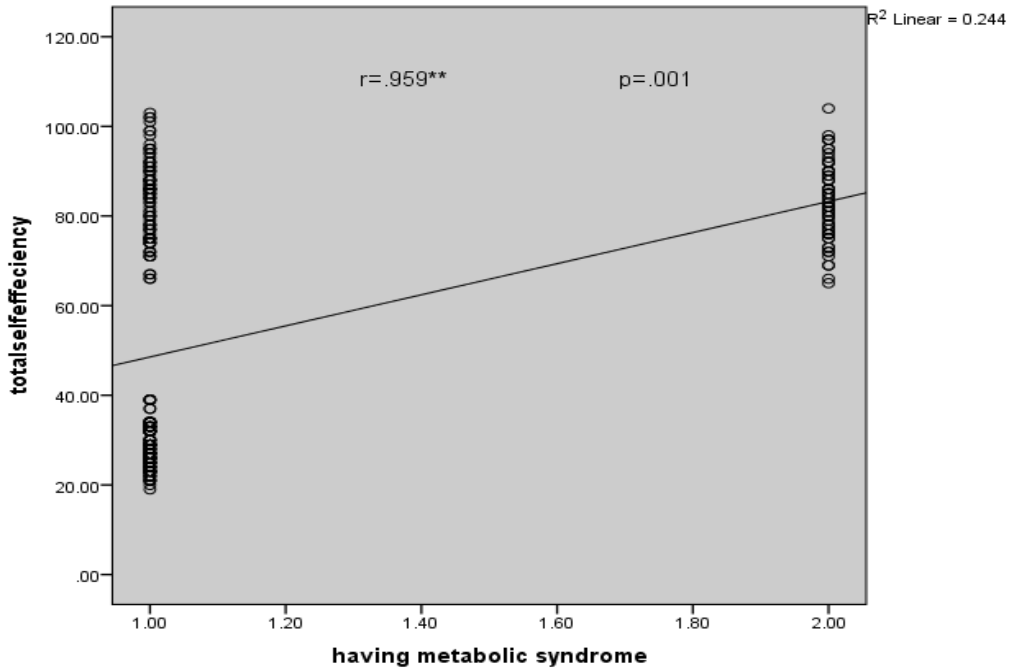

Figure 5: illustrates that there is a positive correlation (r= 0.959) between metabolic syndrome and self-efficiency among studied subjects (P. value 0.001).

Discussion

Lifestyle modification intervention is a significant and essential strategy for prevention and management of metabolic syndrome and its risk factors. Life style modification intervention is a wide way that focuses on exercise, diet, education and/or pharmacotherapy and is known to have beneficial effects on cardio-metabolic risk factors**(Oh, et al., 2010).**Concerning the demographic characteristics of the studied subjects, the present study reported that the mean age of the studied subjects was around fifty years, every one of them were married, the highest percentage of them were males, illiterate , majority of them were working , from rural regions, smoker .and all of them have deficient income. This may be due to that the prevalence of metabolic syndrome is increased in middle- or older-aged. Also, it has been reported that technology, automation and a more comfortable lifestyle encourage sedentary behavior, increase in consumption of high calorie-low fiber fast food.

This finding was in agreement with study **Bosak, et.al., (2010) ;** in their study about Effects of an Internet Physical Activity Intervention in Adults With Metabolic Syndrome, **& Badri, et al., 2017;** in their study about Prevalence of Metabolic Syndrome and Its Related Factors among Adults ; and **Oh, et al.,(2008),** in their study that aimed to identify the effects of the therapeutic lifestyle modification (TLM) program on women with the metabolic syndrome in rural areas, who mentioned that the majority of participants in both groups of their study were male, employed, and lived in an urban area, as well as the majority of their participants in both groups were nonsmokers, with low level of education and monthly income**.** In addition**, Busnello, et al., (2011);** in their study about Nutritional intervention and the impact on adherence to treatment in patients with metabolic syndrome**,** and **Kim, et.al., (2014)** finding in which their study that aimed to evaluate two models of dietary intervention, and the relationship with adherence to treatment and impact on clinical improvement of patients with metabolic syndrome; goes in conflicting with our which revealed that the mean age of their sample was more than fifty years both intervention and control group, and most of their participants were females.

As regard to consensus of the International Diabetes Federation (IDF) for the components of MetS, the present study found that more than half of the studied subjects were having hypertension (SBP ≥130, DBP ≥85 mmHg), more than half of men were having waist circumference more than or equal 94 cm, and majority of women were having waist circumference more than or equal 80 cm. Most of the studied subjects were having FBG level more than or equal 100 mg/dL. Regarding low HDL cholesterol more than half of men were having low HDL cholesterol less

than 40 mg/dL and half of women were having low HDL cholesterol less than 50 mg/dL. More than half of the studied subjects were having elevated triglyceride levels defined as more than or equal 150 mg/dL. This could be due to metabolic syndrome is characterized by the co-existence of central obesity, high blood pressure, hyperglycaemia and dyslipidaemia.

Bosak, et.al., (2010) goes in the same line with the current study discovering on the grounds that they presenting the finding of their subjects with MetS by having low HDL cholesterol, elevated triglycerides, elevated fasting glucose, increased waist circumference, and elevated blood pressure at baseline. Furthermore, this finding was in harmoniousness with who stated that according to the International Diabetes Federation (IDF) definition of MetS the high BP was the most frequent finding of the total sample, with lower ($p < 0.001$) mean HDL-C values and significantly higher ($P< 0.001$) glycemia, triglyceride levels and anthropometric values (weight, waist circumference and BMI).

Just as, this finding was in concurrence with **Badri, et al., (2017)** who demonstrated that the mean (SD) levels triglycerides in men and women were 158 mg/dL and 162mg/dL respectively. HDL-C levels were 43.3 mg/ men and 47.1 mg/dL among women. The mean values of WC were 105 cm in men and 118 cm in women. Systolic and diastolic blood pressure mean level was 130 / 80 mmHg in men and 135 / 65 mmHg in women.

As respect to distribution of patient having metabolic syndrome pre and post application of the nurse-led lifestyle intervention program, the present study illustrated that all the studied subjects were having metabolic syndrome pre-test while more than half of them were having metabolic syndrome post-test. This could be due to that the effectiveness of lifestyle modification on metabolic risks and patient-reported outcomes among adults with MetS remains uncertain.

This finding was supported by **Azizi, et al., (2013)** in their study about The effect of community-based education for lifestyle intervention on the prevalence of metabolic syndrome and its components: Tehran lipid and glucose study who stated that there was increasing in the prevalence of metabolic syndrome and more noticeable in control group of their study as compared to intervention group ($P < 0.002$ for the change between groups).

Regarding to mean and frequency distribution about Self-related ability for health practice (self-efficacy) among patient the present study demonstrated that there was a statistically significant difference between the pretest and posttest of the studied subjects regarding self-related ability for health practice (self-efficacy). This could be due to that self-efficacy plays a basic and essential role in improving a healthy lifestyle.

This finding was in agreement with **Oh, et al., (2008)** in their study about A randomized controlled trial of therapeutic lifestyle modification in rural women with metabolic syndrome: a pilot study **& Zhang, et al., (2018)**

who find that the intervention group (receiving the therapeutic lifestyle modification intervention) had an improvement in their self-efficacy level whereas the control group had a declined level of it .As well as, this finding was consistent with who stated that their intervention group had moderate score of their self-efficacy, and among the four subscales of self-efficacy, both groups had the lowest score in self-efficacy for exercise.

Chen, et al., (2010) & Kim, Park, & Park, (2014) supported the present finding by showing that their participants who received the self-efficacy intervention showed improvement in self-efficacy than those who received conventional outpatient health education only.

The present study showed that there was a statistical significant correlation between metabolic syndrome and Health-Promoting Lifestyle and self-efficiency among studied patients.

Additionally, this finding supported by **Bosak, et.al., (2010)** who stated that there was no change in the median change score for self-efficacy for physical activity in the usual care group compared with a slight improvement in the internet intervention group.

This finding is similar to finding of **Busnello, et al., (2011)** showed that self-efficacy of their intervention group were significantly improved in the intervention group compared with the control group. These findings are supporting the current study's first research hypothesis.

Regarding the mean of the health-promoting lifestyle behavior among the studied patients pre and post application of the nurse-led lifestyle intervention program, showed that there was a statistical significant difference between the pre-test and post-test of the studied subjects regarding health-promoting lifestyle behavior (P. value 0.001). This could be due to that health promotion model has been widely applied in guiding the development of tailored lifestyle interventions among different populations and lifestyle modification is the first-line intervention for metabolic syndrome management, and adopting healthy behaviors is fundamental line for care among patients with metabolic syndrome.

Zheng, X., et al., (2020), supported this finding by their finding that the lifestyle interventions significantly improved the individual dimensions and overall health promoting behaviors at the end of their study. Additionally, this finding goes in the same line with **Saklayen, (2018) &Wu, et al., (2011)** showed that women in their therapeutic life style modification (TLM) intervention group showed significant positive behavior change; almost all of the women tried to control their intake of food and their weight and to exercise 3 times per week .On the other hand, this finding was in disagreement with **Kim, Park, &Park, (2014)** reported that there were no significant differences in exercise and dietary control between their two groups compared with the baseline data of them. These findings are supporting

the current study's second research hypothesis.

As well as the present study illustrated that there was a statistical significant correlation between metabolic syndrome and health-promoting lifestyle behavior among studied patients, and there was a statistical significant correlation between metabolic syndrome and self-efficiency among studied patients .This could be due to that health-related self-efficacy is a basic motivator for one to continue physical activity; hence, it serves as significant determinant of healthy lifestyle promotion. This finding is similar to finding of **Chan, et al., (2018)** in their study about Tai Chi exercise is more effective than brisk walking in reducing cardiovascular disease risk factors among adults with hypertension: a randomized controlled trial, who stated that the improved self-efficacy definitely increased the participants' confidence and initiative for implementing healthy diet, regular exercise and effective stress management.

Conclusion

The result of current study indicates the improvement of self efficacy and health promoting behaviors after application of lifestyle intervention program for patients with metabolic syndrome. As well as, there is a positive correlation between metabolic syndrome and health-promoting lifestyle behavior and self-efficiency among studied patients.

Recommendations

The study recommends that it is necessary to ensure application of lifestyle modification program by nurses as a routine care for patients with metabolic syndrome, and motivate patients' adherence to lifestyle modification as a key factor for achieving reduction in metabolic syndrome components. As well as, replicat this study in large probability sampling and another circumstance after massive training program for nurses regarding life style modification for patients with metabolic syndrome.

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